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Science and Government

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When you were kind enough to ask me to deliver this paper, I assumed and anticipated that you were inviting me as Andrew Mensaros and not as the Minister for Fuel and Energy. Indeed it is on that understanding that I have prepared my talk.

Since my subject is "Science and Government", I should like to take notice briefly of their history and development, their respective activities, and the role that they play in society; and in the course of this, I hope to underline their differences, but at the same time to speak of their interdependence and interaction.

Both science and government have been around for a long time—government perhaps rather longer, since in the Upper Palaeolithic, when science and learning were scarcely conceived, I have no doubt that stronger, and more ambitious cavemen were already clubbing their weaker tribesmen into submission.

In early civilisations, science was sustained by wealthy individuals, and a man who sought knowledge for its own sake needed either to be rich himself or to find a rich patron. Private patrons, however, tended to favour the arts rather than the sciences. They would sooner see their benevolence embodied in a statue or a panegyrical poem than in a theorem or an industrial process—for after all, manufacturing industry in those days was principally the concern of slaves or of freed men. If a man was not rich, and could not find a rich patron, his chances of doing scientific research were slim, for the governments of the ancient world did not generally count the patronage of learning among their functions.

In consequence, the Graeco-Roman world saw a great development of abstract science, of pure mathematics, of the kind of work that could be done by an able man on his own, or at least with comparatively little equipment and few assistants, but little or none of that kind which demands teams of workers, big buildings and bigger budgets.

It is perhaps remarkable that governmental patronage of science did not vary much with the type of government. The ancient world saw many different distributions of power in society, from the earliest patriarchal monarchy through various forms of government by the one or the few or the many, until finally the world-state of the Romans relapsed wearily into an autocracy tempered only by palace revolutions and insurrections by ambitious generals. Under all these types of rule, government funding for scientific research was a very rare occurrence. King Hiero of Syracuse presumably provided workmen and materials to help Archimedes construct his great concave mirrors. This of course was through a desire to drive away the besieging Romans and set afire their ship rather than through a disinterested passion for discovering the laws of optics.

I suppose, however, it is not much different today, when government support for science, and scientific research in most cases—particularly if we are talking about large-scale support—is geared towards defence, towards solving anticipated energy or material shortages, or other pragmatic aims. Such was the case in nuclear physics, in the moon expedition, in missiles development and the like.

There is one recorded example of government aid for pure research which I can recall. When Eratosthenes formed a project for determining the circumference of the earth, King Ptolemy III, an enlightened Greek despot sitting on the summit of the age-old bureaucratic pyramid of Egypt, placed the royal corps of surveyors at his disposal to measure the arc of longitude between Syene and Meroe. A hot, thirsty, dusty job it must have been, but then Egyptian governments seldom became neurotic over industrial relations.

In what we call the Middle Ages, government was even less a patron of science than in Graeco-Roman times, although the first beginnings of artillery, which stimulated interesting developments in mathematics, attracted some attention from government. Curiously enough, it was the Middle Ages which, by the application of the windmill, saw the first major step away from muscle-power in industrial processes. But in essence it is only the last few centuries which have seen the rise of a close interaction between governments and the physical sciences, as the latter have moved from the workshop through the laboratory to the Research Establishment.

Today we are not surprised, indeed we expect, that important and fundamental work in the

[1] Read at an evening meeting held at the University of Western Australia on 24 April 1978 as part of a symposium entitled "What is Science?" organised by the Royal Society and the University of Western Australia Extension Service.

physical sciences will be done in a government research station, or at all events in a university which depends upon the taxpayer's money.

Yet this fact might well have surprised our grandfathers, for government research stations are a very recent growth. Within living memory the older universities were private corporations independent of public funds. Deriving their wealth from the rents of lands (usually the benefactions of former centuries), and assisted by private donations of the wealthy, either for particular or for general purposes, they provided until a couple of generations ago a haven for men who wanted to advance learning, as well as for many who wanted only a quiet and comfortable life. The funds which they thus controlled were adequate for many kinds of study and research.

In the nineteenth century, however, the physical sciences and their practical applications made very great advances, and many of the growing-points of knowledge were outside the universities. For the latest progress in metallurgy, and the design of machines, the bustling workshops of Henry Maudslay, Clement, Nasmyth and Bramah were a better school than the dreaming spires of Oxford.

These engineers were sternly practical men. They were financed (when they needed it) by sternly practical men of business who could see the advantages flowing from the improvement of tool steels and bearing metals and from the application of superheating to steam engines; and of course the assisting of technological research for comparable reasons still finds its place in the profit and loss accounts of big manufacturing firms.

Pure research could not so easily find private backers, and so, among the educated public a sentiment grew that the universities must include scientific research among their activities. Thus at the University of Oxford, that same decade which saw the removal of religious qualifications for the master's degree saw the provision that the colleges must contribute a part of their revenues to the university, with a view especially to the encouragement of natural science. The old sources of revenue now ceased to be enough, and after the First World War, Oxford received—with many doubts and heart-searchings—its first government grant. The timing is interesting, for the end of that war marked an epoch in English government also.

In 1918 women first became able to vote, and consequently for the first time the electorate came near to being the entire nation. Two years later, the Nineteenth Amendment allowed American women also to become political animals. Thus those two great countries were only some twenty years behind Western Australia in this constitutional provision.

It is not an accident or mere fortuity that adult suffrage comes at the same time as governments busy themselves with science for only when a government claims to represent everybody does it meddle in everybody's business. Old-time governments, even when they called themselves democratic, like that of Athens in her prime, did not represent everybody. In all cases their franchise was restricted—in some by nobility of birth, in others by wealth, in others by status—but in all according to some notion of fitness to have a voice and an influence in affairs of state. This concept of fitness, which plays an important part in the doctrines of so libertarian a writer as Mill, plays no part at all in modern political thought or, if it raises its head, it is only to be instantly vilified.

Nowadays we are all equally fit or equally unfit, and we all vote for or against our government. You may think this an excellent thing; you may consider that precisely the same quantum of political sagacity resides in the illiterate teenager as in the emeritus professor; you may think that on questions of economic policy the undischarged bankrupt is as good a man to consult as the succesful director of a giant enterprise; or you may look back wistfully to the days of property qualifications and educational qualifications. But whatever your views, 'one man, one vote' is the system which we now have, and it is not likely to be changed in the foreseeable future.

It is in this system that the scientist and members of government pursue their different activities and purposes, and by this system that they are both conditioned.

The ends of the scientist are principally intellectual. He wants to arrive at new truths, usually by way of experiments under controlled conditions, proceeding by inductive reasoning from particular observations to general laws, which he then tests again by seeing whether their predictions are fulfilled in a new set of particular observations.

But if he is what we call a social scientist, that method of controlled experiment is not normally open to him, and he must rely on the statistical method instead, that is on the records of observations in the past of phenomena which cannot be repeated under the same or under optionally varied conditions.

Here he is on less sure ground because he must select the facts which go into the computer, and if his selection should have excluded any relevant or included any irrelevant fact, the utmost refinement of mathematics will not bring him to the right answer. Consequently there is no guarantee that his advice to government is right. But whatever method he uses the scientist is supposed to be objective, so far as our imperfect human nature will permit.

The tasks of a government go far beyond the administration of the existing code of laws; government must also be alert to detect faults that may develop in the laws, and to amend them if the interest of the people as a whole demands it. New technical developments commonly call for new laws; thus the factory system, the railway and the motor-car each brought forth necessarily a mass of legislation;

and for international air travel an ideal code of laws needs yet to be devised.

New laws necessitated by new technical developments have another nasty, but necessary characteristic—they cut further and further into individual liberties. Some of you might have enjoyed, as I did, the Dyason lecture given decades ago in Winthrop Hall by Professor Toynbee. If you did, you will remember how he exemplified this truth. "In my youth", said the Professor, "I would have called anyone a fool who would have told me that by coming on a red light I will be prevented to cross the Queen's highways. Such an intrusion in my personal rights and liberty would have been unimaginable. Yet today,", he went on sadly, "we all accept this restriction".

A politician as member of government has to take a decision that is going to be acted upon; he usually takes expert advice (if such a thing exists and is available), he must exercise his judgment on that advice, and then make his decision. Unhappily he cannot move with the majestic deliberation of a research worker who matures a theory over some twenty years or takes half a decade to classify a beetle. A member of government will use inductive reasoning as the scientist does, but urgency often forbids the careful checking by difference and similarities which scientific method prescribes. And when he has reached a tentative decision, he must reverse his method and apply deductive processes, examining in his mind the consequences in individual cases of the universal proposition which a law must necessarily be. In the light of any one or of more of these particular consequences, he may wish to modify the general law.

In all these operations of the mind there is an analogy between what scientists do and what governments do; for the scientific method is only organised commonsense, and commonsense is a quality without which government will not go very far.

But in the limitations imposed upon them governments differ greatly from scientists. The scientist makes his way (in principle at least) on merit. To earn his degrees he must satisfy acknowledged experts that he has mastered his trade. To gain academic appointment and promotion he must again give proof of his merit to those who are able to judge. And when he is once appointed, he has security of tenure; being fired by the boss is a contingency against which few university scientists would trouble to take out insurance.

But the poor politician, I hope to make your hearts bleed for him, leads a very different life. He makes his way by finding favour first with his party, then with the electorate, with thousands of voters who may judge him by the most subjective standards; by the length of his nose or the size of his teeth, by the way he looks over his glasses, or—in my case perhaps—by the thickness of his foreign accent. If the contest is a really close one, he may be nosed out by the misfortune of having been allocated by lot the last place on the ballot paper. These electors, who are his academic selection committee, are an unpredictable lot, who are always liable to turn against the favourite and back the outsider. In consequence the modern political analyst often has two occasions of displaying his powers, the first when he brilliantly demonstrates to us the way that the election must go, and the second when he explains, with even more compelling expertise, why his forecast went wrong.

As for security of tenure, there is little enough of that for the government, who every three years must go once again before its capricious selection committee; and this uncertainty may well influence its long-term planning. It is conceivable that a government, taking aim seriously at what it knows ought to be achieved, may calculate that four or five years may be necessary for the required measures to be implemented and to have the beneficial effect, that is hoped. Hence a government, unless it had a quite remarkable confidence in the outcome of the next election, might very well shrink from introducing even the most salutary measures.

I sometimes wonder how much of scientific research would be stultified if every scientist were liable to be discharged from his job at the end of every triennium; if he were to submit himself every three years to a new selection, the selectors comprising the whole adult population. One could also wonder of course how would governments function if their members were selected on merit for a long term of tenure.

This short tenure of office also obliges government to spend a considerable part of its energies, (particularly towards the end of a term) to estimating, anticipating and to some measure managing public opinion. The words "public opinion" are easily spoken, but the thing itself is a nebulous and elusive entity. How do you find it out? How do you estimate the degree of popular support enjoyed by the pressure groups—the women's libbers, the homosexual law reformers, the road users, the friends of the earth? It is always possible that a well-organised pressure group may be regarded by the unorganised majority with indifference or contempt. As a government you have only one infallible way of finding out the state of public opinion, that is by seeing what happens to you at an election; but that is like being sandbagged in the dark. Can we somehow see the sandbag in advance?

The power of the mass media is a hotly-disputed topic. On the one hand, the effectiveness of television advertising has been proved again and again. One might well think that the same skilfully applied pressure, which makes us change our soap-powder could go far to making us change our government. On the other hand, to switch from one brand of soap

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powder to another is relatively cheap and not a dangerous experiment; but the decision that it's time for a change in one's government could be expensive, even perilous, and therefore consumer resistance might well be higher.

The effectiveness of the mass media (in other ways than advertisements) in influencing public opinion is a matter on which decisive proof is hard to obtain. It seems to me however that, in a country where press, radio and television are free, they have much more power in influencing public opinion, than government does. Indeed, I am quite satisfied from my own personal experience that the media do not reflect and express public opinion as they claim, but that they create, formulate and influence public opinion, Hence it is questionable today, I think at least, whether public opinion exists at all or is it media opinion, renamed public opinion? At all events, it is one advantage which the scientist enjoys over government, that he very seldom has to bother whether the newspapers or the ABC are against him.

This advantage is one aspect of the scientist's freedom from the permanent warfare of party politics. In most matters connected with his expertise he will agree with his colleagues. Even where he quarrels with them, the issues are normally thrashed out in publications which none but the specialist reads, so that the general public seldom beholds the spectacle of scientists at loggerheads. On the other hand, such headings as 'Court lashed over bauxite' or 'Grayden hits at critics' are in every issue of *The West Australian*. Indeed, the only times when scientists brawl in public are when they advise governments. Then, I fear, some of our deplorable pugnacity must rub off onto them; for scientific detachment seems to take a back seat when wood-chipping or uranium-mining comes into question. Further, such brawls seem always to drag in on the one side the fears of those who distrust and resent all change, and on the other the restless meddling of those who favour any change for change's sake.

Amid the tumult government must take the decision and bear the responsibility, knowing that it may reach that decision on the basis of the best advice at the time, but that it will be judged entirely by the event, whether predictable or not; indeed very often those who least expected something themselves will be the readiest to blame government for not foreseeing it. This tendering of advice by science to government is one aspect of their complex interaction, by which government funds science and science advises government what to do with its funds. If the moneys available were unlimited, problems of funding scientific and technical research would be a great deal easier; for all learning is good, and one would like to help all reasonable projects.

But funding scientific research is in some respects like planning a curriculum for a school, for in the latter case it is possible to make out an argument in favour of any given subject in itself. Who can say that there is no value at all in studying Sumerian mythology or the history of glass-blowing? Yet only a few subjects can find room in the timetable, and in consequence each has to show not only absolute merit, but relative merit in comparison with its rivals. Thus, if there was enough money, one would gladly pour ample funds into research programmes in solar energy, tidal energy, wind energy, wave energy, geo-thermal energy, to say nothing of the complex problems of nuclear energy and its by-products. But there is not enough money, and a government is always tempted to simplify matters by supporting a few claimants only and rejecting most others.

Similarly, based on economic reasoning, there is the catch-cry of not duplicating scientific research, or even educational institutions (some of you might be familiar with the celebrated Partridge report). "Bigger is cheaper" is the accepted slogan here. I always thought this was false economy. Not only is bigger not necessarily cheaper, but it does not achieve the best possible result since it only achieves one result leaving aside and dormant the many possibly better results through different, better approaches.

Such "no duplication" decisions are attractive to the bureaucratic-administrative mind, but they can be disastrous. Such a disaster befell botany and zoology in the U.S.S.R. when Stalin decreed that only Lysenko was right and proletarian, while the other geneticists were wrong and bourgeois. By such decisions one does indeed avoid duplication of effort and expense; but in science as in politics some competition is necessary, for otherwise there would be no diverse original thoughts, but only one man's directives for other men to implement.

One thing, however, in this interaction of science and government is quite certain; government is never likely to go wrong for lack of expert advice; indeed it is more likely to flounder in a sea of it. I have sometimes wondered whether administrators of earlier centuries, with little or no scientific advice, made worse or better decisions than we do. The population of this State first passed the million mark in 1971. I wonder how many of us would be here if the first settlers had to wait for the results of a feasibility study, whether Western Australia should or should not be settled?

Mr Chairman, I fear I have spoken too long, and presumed upon your good nature too far. Perhaps you did not take the necessary scientific advice, for you might not have invited me if you had appointed a committee of statisticians to estimate how long it takes a Minister to run out of fuel and energy once he opens his mouth. But if I have taxed your patience too greatly, I can only say with the celebrated entertainer Tom Lehrer, who is a scientist but not a politician—"You should never have let me begin".